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tongues, in which he has set forth the subject with great fairness and excellent judgment, and with whose conclusions I fully agree. It seems, however, pertinent to call attention to the fact that what is true of the tongue is equally true of many other parts of the avian structure, as the bill, the feet, the wings, the tail, the sternum, the principal bones of the limbs, various internal organs, etc. In some cases the bill, the foot, or the sternum, as in the case of the tongue of a Woodpecker, would suffice for the reference of the owner to its proper order, or family, or even genus, while in other cases such parts, when isolated from the rest of the bird, would give no certain indication of its affinities. Particularly is this true of the bill, which, like the tongue, is so intimately concerned with the nature of the food and the manner of its procurement. Indeed, in the case especially of conirostral and dentirostral birds, one might easily be in doubt as to any one of half a dozen quite distinct groups, as witness the old genera *Muscicapa*, *Turdus*, *Fringilla*, *Emberiza*, *Sylvia*, etc., under which species of entirely different families were combined until long after the close of the Linnæan period.

All this simply goes to emphasize again the well-known fact that no single organ, or even a single set of characters, osteological or otherwise, can be taken as the basis of a system of classification, or even be relied on to furnish sure evidence of relationship, unless within narrow limits. Probably Mr. Lucas could quite as easily show that the taxonomic value of almost any other organ was nearly if not quite as small, when taken by itself, as that of the tongue.—J. A. ALLEN.]

NOTES ON SOME OF THE BIRDS OF SOUTHERN CALIFORNIA.

BY FLORENCE¹ A. MERRIAM.

THE following notes were made during the spring migration and nesting seasons of 1889 and 1894, at Twin Oaks, San Diego County, California. Twin Oaks is the post-office for the scattered ranches of a small valley at the foot of the Granite Mountains, one of the coast ranges. It is forty miles north of San Diego, and twelve miles from the Pacific. As the surrounding country is mainly treeless, its fauna is restricted, but this valley has a

natural system of irrigation in numerous side cañons that ditch down the spring rains from the hills, and as a result has a rich growth of sycamores and live oaks along the lines of the spring streams, with water near enough the surface to feed the vineyards, orchards and eucalyptus groves, and the grain and alfalfa fields that cover its floor. Moreover, the enclosing hills and the uncultivated parts of the valley are overgrown with chaparral, which offers a cover for many species that would not live out in the open ; so that the valley not only affords a rich food supply to a great number of individual birds, but its vegetation is sufficiently varied to attract an unusual number of species for such a small section, in the arid west.

The orchards, eucalyptus groves, grain and alfalfa fields have largely been planted within the last six years, and must exert an important influence upon the future valley fauna. But unless the economic value of the birds is soon demonstrated and understood there is danger that the ranchmen, moved by the too obvious harm the birds do the fruit, may check the incomers or actually exterminate the more obtrusive species.

Callipepla californica vallicola. VALLEY QUAIL.—In 1889, Quail were so numerous that the dust of the roads was printed with their tracks, and it was an every-day matter to have them start out of the brush and run ahead of the horses quite unconcernedly, pattering along in their stiff, prim way, with their top knots thrown forward over their beaks. In fact the Quail were so abundant as to be a pest. For several years great flocks of them came down the cañons to Major Merriam's vineyard, where they destroyed annually from twenty to thirty tons of fruit. In one season, July to October, 1881, one hundred and thirty dozen were trapped on his ranch. The result of this wholesale destruction was manifest when I returned to the valley in 1894. The birds were then rarely seen on the roads, and seldom flushed in riding about the valley.

Carthartes aura. TURKEY VULTURE.—Mr. W. W. Merriam watched two of the Buzzards eating skunks. They began by pulling the skin from the head and ate till they came to the scent gland, which was left on the ground.

Falco sparverius deserticolus. DESERT SPARROW HAWK.—March 30, 1889, a Sparrow Hawk was feeding its mate at the nest. The mouth of the nest was so small that it was difficult for the brooding bird to get in or out. It would fly against the hole and attempt to hook its bill over the edge to pull itself in, but its shoulders were too broad for the space and the only way it succeeded was by raising its claw to clasp the edge of

the hole, by that means laboriously drawing up its body and wedging itself through. June 2, 1894, I found young Sparrow Hawks nearly ready to fly.

Strix pratricula. AMERICAN BARN OWL.—April 5, 1889, I found one nesting in the charred hollow of a sycamore limb. Edwin Merriam told me that he had known the birds to change places on the nest in the daytime, and both birds to stay in the hole. They seemed to fly into any dark hole they could find to protect them during the day. A number were found in a partially covered well in the valley, and three were taken from a wind-mill tank in the neighborhood in about a month. In a mine at Escondido a number were found sitting in a crevice where the earth had caved, and about a dozen more at the bottom of the mine shaft, fifty to a hundred feet underground.

Bubo virginianus subarcticus. WESTERN HORNED OWL.—Found a nest with young, April 9, 1889. Saw another brooding, April 23, 1894.

Speotyto cunicularia hypogæa. BURROWING OWL.—The Owls, besides using ground squirrel holes, built in old badger holes in the red lands of the San Marcos grant. I once saw nine sitting around one burrow.

Geococcyx californianus. ROAD-RUNNER.—In May, 1894, I found a nest in a eucalyptus grove, about seven feet from the ground. It was partly lined with horse manure, which I was told the birds often used in their nests in the vicinity. The Road-runner is so protectively colored that when crossing a bare field it does not attract the eye, but when it stops and raises its long neck and tail, it looks like two sticks in the meadow.

Melanerpes formicivorus bairdi. CALIFORNIA WOODPECKER.—May 12, 1894, I found a pair of the Woodpeckers nesting. June 16 I heard the weak voices of young. July 6 the old Woodpeckers were found dead and I had the young taken from the nest, apparently just about ready to fly. The old birds were very shy at the nest, but at their hunting ground, nearly half a mile away, where they went to get food for the young, they were indifferent to spectators. They perched on a sycamore limb and made sallies over the alfalfa or out in the air. They also hunted from the posts of the wire fence. They seemed to light indifferently on top of the posts or against their sides, and I often saw them perch on a horizontal limb of the sycamore. They seemed more like Flycatchers than Woodpeckers, they spent so much time on the wing catching insects. In general habits they closely resemble our eastern *Melanerpes erythrocephalus*. Their cries and calls are almost identical.

Edwin Merriam told me that the Woodpeckers excavate nests a foot and a half to two feet deep, often making several elbows, changing the angle to the excavation to follow the soft wood. He said the birds seem to prefer the white oak for building, as for storing acorns; and use the same hole year after year, for the outer shell of the white oak—unlike the live oak—is very durable. The century plant grows wild on the ridges of the hills near the San Luis Rey mission, and he has found the

Woodpeckers filling their stalks with acorns, from six to fifteen feet up. As there were no oaks within five miles, the tall stalks of the agaves were the most convenient storehouses for the birds. In the Julien Mountains he found the pines and the dead deciduous oaks girdled with holes. The Flickers at one time made holes in the thin walls of a neighbor's honey house, and the Woodpeckers used the holes for their acorns. Mr. Merriam was at work in the house one day when they came, and the acorns dropped on the bench by his side. Dozens were also lying on the floor.

Colaptes cafer. RED-SHAFTED FLICKER. — April 8 and 18, 1889, I found Flickers excavating nests in sycamores. June 20, 1894, a pair were brooding in a charred hollow of a small oak. One of the sycamore nests was in the under side of a branch that slanted at an angle of forty-five degrees. The Flicker hung with claws planted in the hole, and with its tail braced at an angle under it, leaned forward to excavate. Using its feet as a pivot, it gradually swung in farther and farther; and when it had gone so far that it had to reach back to throw out its chips, it swung in and out on its feet like an automatic toy wound up for the performance. When it had been building for a week, only the tip of its tail protruded from the nest hole as it worked.

One September Mr. Merriam found Flickers storing acorns in the Julien Mountains. He says they often tried several holes before they found one that the nut would fit.

Trochilus alexandri. BLACK-CHINNED HUMMINGBIRD. — March 23, 1889, I found a nest in an oak with nearly fledged young. April 2, 1889, found a Hummingbird building in a sycamore, about ten feet from the ground. April 29, 1889, found one building near the tip of a hanging oak branch, about five feet from the ground. April 3, 1894, found nearly grown young in an oak nest fifteen feet above the ground. April 28, 1894, found a Hummingbird feeding young — just hatched — in a nest three to four feet high. May 17, 1894, found one brooding in an oak fifteen to twenty feet from the ground. May 22, 1894, found a nest just begun in an oak four to five feet from the ground. May 26, 1894, found a bird brooding on a nest in a eucalyptus grove, six or seven feet up. June 2, 1894, found a nest being built at the end of an oak spray three to four feet from the ground. June 20, 1894, found a Hummingbird feeding young out of the nest in a eucalyptus grove. The oak nests were in low, hanging, drooping branches or in oak tops. They were made of yellow, spongy down from the under side of sycamore leaves, and when built among green oak leaves had flakes of light green lichen on the outside. The eucalyptus nests did not have the lichen. One of them was fastened on the curve of a drooping branch, and to make it set true was deepened on the lower side so that it measured an inch and three quarters.

The peculiar feature of the building was the quivering motion of the bird in moulding. When the material was placed she moulded the nest like a potter, twirling tremulously around against the sides, sometimes

pressing so hard she ruffled up the feathers of her breast. She shaped the cup as if it were a piece of clay. To round the outside she would sit on the rim and lean over, smoothing the sides with her bill, often with the same tremulous motion. When she wanted to turn around in the nest she lifted herself by whirring her wings.

May 24, 1894, I saw a female Hummingbird sit on an oak twig, while a male, with the sound and regularity of a spindle in a machine, swung back and forth in an arc less than a yard long. He never turned around, but threw himself back at the end of the line by a quick spread of the tail.

May 19, 1894, I saw two different males go through a similar performance, though I could not discover the females. They flew backwards and sidewise, not turning around. They dove with gorgets puffed out and tails spread, making a loud whirring sound. April 26, 1889, while riding along the chaparral, I stopped a few moments and a Hummingbird shot down at my horse, darted up in the air and shot down again about a dozen times. It stopped itself in going up by suddenly closing its wings, then it turned around, opened its wings and darted down, "all sound." When hovering around oak trunks and feeding from flowers, I have seen the birds throw themselves up by giving a toss with their tails.

Selasphorus rufus. RUFOUS HUMMINGBIRD.—In April, when the wild gooseberry bushes are in bloom, they are fairly alive with the Rufous Hummingbirds, who find food in the red tubular blossoms. The whizzing and whirring lead you to the bushes from a distance and as you approach, the birds dart out, shoot up into the sky, sweep down and, pell mell, chase after each other through the air. The Rufous Hummingbirds must have been migrants at Twin Oaks, for they disappeared entirely.

Tyrannus vociferans. CASSIN'S KINGBIRD.—April 28, 1889, I found a Flycatcher's nest in a sycamore. The birds also built in the oaks near the house, making a bulky untidy nest, with string dangling from its sides. May 30, 1894, a pair were still building in a sycamore. Mr. Merriam told me that when he was plowing and the Blackbirds were following him, two or three of the 'Beebirds,' as he called them, would take up positions on stakes overlooking the flock; and when one of the Blackbirds got a worm that he could not gulp right down, a Beebird would dart after him and fight for it, chasing the Blackbird till he got it away. For the time the Flycatchers regularly made their living off the Blackbirds as the Eagles do from the Fish Hawks.

Myiarchus cinerascens. ASH-THROATED FLYCATCHER.—Seen in the chaparral and in the orchards hunting low for insects. Their calls closely resemble those of the eastern Great-crest, *M. crinitus*. Some are like *quir'r'r*, *quirp'* and *quir'r-rhea'*. The bird also says *hip'*, *hip'*, *ha-wheel'*, the *hip* emphasized with a vertical flip of the tail, the *wheel*, with a side-wise dash. The Flycatcher has besides a low call of *hip* and *ha-whip*. Mr. Merriam told me that the birds nest in old Woodpecker holes, and line their nests with hair.

Sayornis nigricans. BLACK PHŒBE.—April 30, 1889, I found three eggs in the nest of a Black Phœbe five feet down in a deserted well. Before the eggs hatched, a pump was put down the well and water pumped up every day, but the birds did not desert the nest. In 1894 a pair of Phœbes built inside a whitewashed lath chicken house. The nest, made of large pellets of mud like a Swallow's, was plastered against a board in the peak of the chicken house.

Contopus richardsonii. WESTERN WOOD PEWEE.—June 29, 1894, a Wood Pewee was brooding in a small oak, having moved from its first attempted nest in the top of a high oak, probably driven away by Blue Jays.

Aphelocoma californica. CALIFORNIA JAY.—The flight of these Jays is often undulating. Mr. Merriam told me that he had frequently seen them carrying acorns. One year they took them from the oaks by the house to a side cañon half or three-quarters of a mile distant. Forty or fifty of them were at work, straggling along a few at a time, all day long for a period of a week or more. Sometimes they had two acorns in their bills. In Moosa Cañon the Jays carried the nuts from the bottom of the cañon to the sides of the hills above; and at another place, near Ocean-side, they carried them four miles, from the oaks of the valley to the chaparral of a mesa.

Xanthocephalus xanthocephalus. YELLOW-HEADED BLACKBIRD.—I saw large flocks of them on the mustard seven miles west of the valley, and found one in the vineyard with Brewer's Blackbirds and Redwings.

Icterus cucullatus nelsoni. ARIZONA HOODED ORIOLE.—April 23, 1889, a pair were building in an oak beside a ranch-house. They made their entire nest of the orange-colored parasitic vine, the dodder of the meadows.

Scolecophagus cyanocephalus. BREWER'S BLACKBIRD.—They usually began building about March 25. They nested familiarly in the oaks beside a house and also in sycamores. When the vineyard was being cultivated, all the Blackbirds of the valley, both Brewer's and Redwings, assembled to follow the plow.

Mr. Merriam told me that he had seen flocks of perhaps five hundred Blackbirds, of both species, fly down and light upon the backs of a band of grazing sheep. At such times a few of the birds would pick out wool for their nests, bracing themselves on the backs of the sheep and pulling where the wool had been loosened by the scab. He had also seen the birds ride hogs, horses and cattle, but he said the horses usually switched them off.

Carpodacus mexicanus frontalis. HOUSE FINCH.—The commonest bird in the valley, building about the houses more familiarly than Robins.

Chondestes grammacus strigatus. LARK SPARROW.—Seen frequently in the orchards. Its song resembles that of the Song Sparrow, but is richer and has a purring quality that characterizes it. Saw one carrying building materials, April 9, 1889.

Habia melanocephala. BLACK-HEADED GROSBEAK.—The Grosbeak has a marked habit of song flight. At its best, with the exception of the

Thrush, his song excels that of any bird I have ever heard. It is singular in its exquisite finish, and remarkable for its rich musical quality. It is a long song, greatly varied. It begins with the ordinary Grosbeak swinging pendulum phrase which is followed by a soft low measure, after which the pendulum and the low phrase are repeated. Then come a series of thrills preluding the most beautiful part of the song—a clear tender whistle, each note of which is drawn out so slowly and is so liquid and well rounded that it seems as if the bird were consciously perfecting it. Sometimes after this the Grosbeak, with a grace note, goes on to a final low trill and whistle; and then, after a momentary pause, begins all over again.

Passerina amœna. LAZULI BUNTING.—April 30, 1894, I found a pair building in the mallows. May 12, the female was brooding. May 29, the male was feeding the young. May 30 the nest was empty. June, 1894, I found a Lazuli's nest, made largely of oat stalks, in a tree in a eucalyptus grove, a great contrast to the gray nest in the weeds out in the fields.

Petrochelidon lunifrons. CLIFF SWALLOW.—Saw a large number of them getting mud from a temporary pond early in April, 1889.

Lanius ludovicianus excubitorides. WHITE-RUMPED SHRIKE.—April 10, 1889, there was one egg in a nest made in a clump of willows. June 1, 1894, a pair were feeding young in a nest made in a ball of mistletoe in the top of an oak. June 16, I found a family of young being fed in the chaparral.

Helminthophila celata lutescens. LUTESCENT WARBLER.—A very quiet minute workman, hunting among the golden tassels of the oaks with whose color it harmonizes perfectly. It will lean over the tip of an oak bough to examine a tassel, stretch up to reach a blossom hanging over its head, hop along a twig, and then flit up to cling head down to a spray of leaves, or flutter like a Hummingbird under a yellow tassel.

Dendroica auduboni. AUDUBON'S WARBLER.—One of the most abundant birds in March. It is as restless and active as the eastern *D. coronata*.

Harporhynchus redivivus. CALIFORNIA THRASHER.—April 29, 1889, I found a family of young, three quarters grown. In song and general habits the Thrasher is much like our eastern *H. rufus*. The bird uses its curved bill most skilfully. Instead of scratching with its feet as the Chewinks and Sparrows do, it uses its bill almost exclusively. I once watched one hunt for food. It cleared a space by scraping the leaves away, moving its bill through them rapidly from side to side. Then it made two holes in the earth, probing deep with its long bill, and after taking what it could get from the second hole returned to examine the first one as if to see if anything had come to the surface there.

Thryothorus bewickii spilurus. VIGORS'S WREN.—April 18, 1889, a pair of these Wrens had young in an old nose bag hanging on a peg in a shed. April 23 a Linnet's nest with one egg was in the nose bag on top of the dead nestling Wrens.

Troglodytes aëdon aztecus. WESTERN HOUSE WREN.—April, 1889, I found a number of nests in sycamore holes and about buildings. One was in a grape crate, and twigs were strewn loosely over one end of the box, covering a space nearly sixteen inches square. The compact high body of the nest measured eight by ten inches, and came so near the top of the crate that the birds could just creep in under the slats. Some of the twigs were ten inches long. April 28, 1894, I found a pair of Wrens carrying twigs to a sycamore hole. June 4 the young were being fed rapidly; but the birds did not leave the nest till June 16. Both the old birds had a striking habit of moving their wings tremulously at their sides, and sometimes the male, when singing to his mate, would raise his quivering wings till they almost met over his back.

Parus inornatus. PLAIN TITMOUSE.—March 24, 1889, I found a pair building; on May 12, they were feeding the young in the nest. June 15, 1894, I saw a pair feeding young out of the nest. The nests I found were in the crack of an oak, about four feet from the ground, and in the under side of a decayed branch, fifteen or twenty feet above the ground. When hunting, the birds flattened their high crests to small points at the back of the head.

Chamæa fasciata henshawi. WREN-TIT.—April 3, 1889, I saw two Wren-tits carrying material, but could not find their nest. June 8, 1894, I saw a family of young in the brush. The birds live in the cover of the chaparral. Their long tails tilt up and down as they fly, and sometimes rise over their backs when they light. In looking for food the Wren-tits often hold their tails up and hunt in the careful way of the Wrens. Their scold, which is a loud chatter, is also wrennish in character.

The song is the most striking thing about the Wren-tit. From it the people of the valley call him the 'scale bird.' He is not seen unless you go to the brush to look for him, but wherever you are you will hear the clear ringing voice running down the scale, the bell-like tones now coming from the chaparral of the valley, now from the boulder-strewn hillsides above. The Wren-tit seems timid about singing in sight and it was a long time before I connected the quiet obscure bird with the loud beautiful voice. But one day when watching a Wren-tit it puffed up its throat till its feathers stood out in layers, and brought out the slow distinct notes of the descending scale, its tail shaking with each note.

Although the general character of the song remains the same, it varies somewhat in the notes and their relative rapidity. I have heard the whole song given on one note, the first four uttered very slowly, the last four faster, but a commoner form has nine notes, the last five running down the scale. At times the first four notes are given alone, as *keep, keep, keep, keep*; at others, as two syllables, *keep'-it, keep'-it, keep'-it*—three repetitions of the same note. A common form is a scale of seven two-syllabled notes—*tip'-it, tip'-it, tip'-it, tip'-it, tip'-it, tip'-it, tip'-it*. Again one hears a combination of the one and two-syllabled notes, the first four on one

note, the rest going down the scale, as *keep, keep, keep, keep, keep'-it, keep'-it, keep'-it*. There is also a rapid run with a rolled *r*.

The Wren-tits are hard birds to study because it is so difficult to penetrate the brush where they live; but one gets occasional glimpses of them outside. I once saw one break up a Gnatcatcher's nest in an oak on the edge of the chaparral, and afterwards came on one that was persistently feeding the fledgling of a Lazuli Bunting, although both parent birds were on the spot.

***Psaltriparus minimus californicus*.** CALIFORNIA BUSH-TIT.—In March and April, 1889, and April, 1894, I found a number of the birds building. One of the nests I was watching pulled down of its own weight, closing in the entrance. Its wall, made of fine gray moss and oak blossoms, was half an inch to an inch thick, and had a wadding of feathers inside. I counted three hundred, and there were a great many more. There must have been several dozen chicken feathers, each from two to three inches in length. The builders profited by experience in an interesting way. Their second nest, to begin with, was not nearly so long as the first one, although that may have been from the additional labor the extra length would entail. They hung the nest between the forks of a twig whose cross twig could support the top. At first they put the entrance about half an inch below this supporting cross twig, but afterwards moved it up above the twig so that the roof could not possibly close the hole as it had done in the first nest. This time the hole itself, which was usually the girth of the bird, was made much larger than in the old nest. The birds used the materials of the deserted nest to make the new one. In building, they began at the top of the open pocket—at the cross twig—leaving the roof till the last, though they made the first entrance while the lower part of the nest merely hung in loose fibres—was not formed at all. In making the body of the pocket they would light on the cross twig and swing themselves down inside, hanging by their claws while they placed their material and moulded and shaped the pocket from the inside. When the nest was completed it had a quantity of brown oak tassels around the entrance, which was finished neatly with lichen.

The Bush-tits are rapid workers. I found a nest begun one day, only a filmy spot in the leaves, and the next day it had grown to be a gray bag over eight inches long, though I could still see daylight through it. The birds work together and give their fine call of *schrit, schrit*, as they go and come about the nest. Their long tails give them a long tilting flight. The Bush-tits are very abundant at Twin Oaks. I have often found two of their nests in one oak. In 1889 I found eight nests in oaks, from seven to fifteen feet from the ground, but none in 'low bushes.' Mr. Merriam told me that out of dozens of nests, he had found only one in a bush. He thought the live oak nests averaged from eight to nine feet from the ground. He said the birds often weighted the nests with sand and sometimes built a projecting roof over the entrance.

***Poliioptila cærulea obscura*.** WESTERN GNATCATCHER.—April 29,

1889, I found a nest in a small oak, containing two eggs. May 4, 1894, I found a pair brooding. May 16, a pair were building in an oak, fifteen to twenty feet above the ground. May 28, the birds seemed to be through building and were flitting about warbling and apparently taking a rest before time to begin brooding. May 31, after a Blue Jay had created an excitement in the oak, the Gnatcatchers began taking their nest to pieces, and went to work putting it up in a low oak a few rods away. June 7 the birds were still building. June 11 they were brooding, changing places in the nest. June 25 the young were being fed. July 4 the young were out, being fed in the brush. From May 16, or more accurately May 14—for the nest had been begun at least two days before I found it—from May 14 to July 4, those birds were working to get one brood launched. The first nest took them two weeks, the second one about ten days. Their method of work was interesting. The nest was laid on a horizontal branch. Their plan seemed to be twofold, to make the walls compact and strong by using only fine bits of material and packing them tightly together—drilling them in—and at the same time to give the walls form and keep them trim and shipshape by moulding inside and smoothing the rim and the outside. Sometimes the builder would smooth the brim with its neck and bill like a Redstart, as a person sharpens a knife on a whetstone, a stroke one way and then a stroke the other. The birds usually got inside to work, but there was a twig beside the nest that served for scaffolding, and they sometimes stood on that to work on the outside. They both worked, flying rapidly back and forth with material. The second nest rested lightly on a horizontal limb, but was supported mainly by two twigs which forked so as to enclose it. It was a beautiful nest, covered with lichen and lined with feathers. The birds were not at all shy. They let me come so near that I saw the black lines bordering the blue forehead of the male.

***Sialia mexicana occidentalis*.** WESTERN BLUEBIRD. — Mr. Merriam told me he had seen the Bluebirds build in the mud nests of Swallows in trees; but most frequently in knot holes and in the abandoned nests of the small Woodpeckers.

THE LAW WHICH UNDERLIES PROTECTIVE COLORATION.

BY ABBOTT H. THAYER.

THIS article is intended to set forth a beautiful law of nature which, so far as I can discover, has never been pointed out in print. It is the law of gradation in the coloring of animals, and